

above the normal. The greatest amount, 20.03 inches, occurred at Monmouth, Ill.; and the least, 0.89 inch, at Pembina, N. Dak. The greatest amount in 24 hours, 7 inches, occurred at Bloomfield, Iowa, on the 28th. Measurable precipitation occurred on an average of 12 days. A trace of snow was recorded at Crosby and Donnybrook, N. Dak., Warroad, Minn., and Elma, Iowa.

SUNSHINE AND CLOUDINESS.

The average number of clear days is 10, partly cloudy 9, and cloudy 11. The duration of sunshine was considerably below the normal.

WIND.

Southeast winds prevailed. The highest velocity reported was 48 miles an hour from the northwest, at Springfield, Ill., on the 6th.

RIVERS.

At the close of the month the rivers in this district were higher than they were at the close of August, and they were also higher than at the close of September, 1910. The highest stage of the Mississippi River at Dubuque, Iowa, was 3.2 feet on the 30th; lowest, 1.2 feet on the 6th; average stage for the month, 2 feet. At Prairie du Chien, Wis., the maximum stage was 2.8 feet on the 29th; lowest, 0.6 foot on the 6th; average for the month, 1.5 feet. The Wisconsin River at Wausau, Wis., ranged from 3.2 feet on the 6th to 6.7 feet on the 15th, the average for the month being 4.5 feet. At Portage, Wis., it ranged from 2.4 feet on the 5th and other dates to 5.1 feet on the 20th; average, 3.5 feet. At Muscoda, Wis., it ranged from 0.9 foot on the 11th to 2.7 feet on the 22d; average, 1.7 feet. The rainfall in the upper portion of the Wisconsin River Valley was comparatively light, which accounts for the low stages in that river. In the Davenport River district the stages of the Mississippi River averaged nearly 2 feet above those reported at the close of August, but through traffic over the Le Claire Rapids had not been resumed. Owing to the excessively heavy rains in central Illinois, southeastern Iowa, and northeastern Missouri, the rivers in those sections overflowed their banks and caused much damage to property. Mr. Clarence J. Root, section director, Springfield Ill., reports as follows:

The floods damaged or destroyed many bridges and culverts, and railroad traffic was delayed on account of washouts and damaged bridges. The Illinois River at La Salle was above the flood stage on the 19th and 20th, but the damage was slight. The river was above the flood stage at Beardstown after the 28th.

The following extracts from the reports of observers will show the conditions in various sections:

Lincoln, Prof. C. S. Ogilvie: Corn in creek bottoms washed away. At end of month streams are badly out of their banks. Small bridges and fences washed away, and the historic Rankin flour mill destroyed.

Alexander, George H. Hall: At the end of the month all streams were raging torrents, washing out bridges and culverts, and ruining practically all corn in the lowlands. At Jacksonville, Mauvis Terre Creek was $1\frac{1}{2}$ feet higher than it had been for 25 years. Cellars were flooded.

Windsor, Herbert Rose: Several hundred acres of corn were washed out in bottoms; only half of the clover has been thrashed.

Rushville, H. F. Dyson: The loss of crops in Schuyler County is estimated at more than a half million dollars. There are three streams that overflowed, and this year every patch in the bottoms was in corn. The loss in the drainage district will be considerable.

Clinton, J. F. Ziegler: The heavy rains of September 25 washed out a portion of the dam of an artificial lake at the Chautauqua grounds, allowing the water to completely escape with the loss of its entire stock of fish and devastating fences and fields in its course.

Quincy: Between 75 and 100 bridges and culverts were washed out in Adams County, causing a damage of \$25,000 or \$30,000.

Mr. George Reeder, section director, Columbia, Mo., says:

It is reported that Fabius, North, and South Rivers were in flood, and much of the fertile bottom lands are under water, doing considerable damage to crops. The Mississippi River at Hannibal rose rapidly on the 24th.

SEVERE LOCAL STORMS.

Thunderstorms were frequent and were in many cases accompanied by heavy hail, destructive winds, and torrential rains, the worst of which occurred in central Illinois and southern Iowa. On the afternoon of the 17th a severe thunder and hailstorm crossed the southern portion of Minnesota. At Pipestone, Pipestone County, hail fell to the depth of 3 inches. At Fairmont, in Martin County, the storm was also very severe. In the county east of that place hailstones 4 inches in circumference fell. At Grand Meadow, in Mower County, the storm was unusually violent. A severe and destructive hailstorm occurred in portions of Trempealeau, La Crosse, and Vernon Counties, Wis., on the afternoon of the 11th. The following extracts are taken from La Crosse, Wis., papers of the 12th:

Hailstones as big as hen's eggs shattered thousands of window panes in and about La Crosse shortly after 4 o'clock yesterday afternoon, causing the loss of several thousand dollars. The largest stones did not fall very thickly, one following another at short intervals. The noise made by tin roofs was almost deafening. The greenhouse owners, as usual, were the heaviest losers, over 25,000 square feet of glass was broken, and plants and flowers in several of the greenhouses were cut by falling glass. The hail was accompanied by a drenching rain, one of the heaviest ever experienced within the short space of time during which rain fell. The temperature fell 20° at the time of the storm. Reports indicate that the storm was also severe at Trempealeau, Trempealeau County, and at Veroqua, Vernon County.

A storm that bore every evidence of true tornadic character occurred in the vicinity of Winterset, Iowa, on the afternoon of September 6 between 2.30 and 3 o'clock. The storm cloud presented a white or smoky appearance, and the attendant lightning and thunder were terrific. Spasmodic precipitation, amounting to 0.78 of an inch, fell at Winterset, being very heavy both during and after the passage of the storm cloud, which moved toward a point a little south of east. Hail of the size of hickory nuts fell in places. The storm's path was approximately 20 miles in length and from 30 to 80 rods in width. The following extracts are taken from a report on the storm, rendered by Dr. Robert S. Cooper, cooperative observer at Winterset:

The first material damage was done at Tileville, where the residents saw a funnel cloud bearing down upon them. It appeared as a whirling, smoky mass, and with a roar that was distinctly heard. All the buildings but one were wrecked. The south side of a house almost new was bulged outward and spikes and nails from barns to the north were driven into the west side. Three horses were carried about 100 yards toward the southeast, having been lifted over two fences without injury. A little farther on an outhouse and a chicken house side by side were driven in opposite directions, one north and one south. Still farther on a baby was found under the wreckage of a house beside a hen which had been killed, the child being uninjured. At another place the axle of a buggy was found bent around a tree. Near by a steel bridge in the path of the tornado was whirled into a twisted mass and deposited in the river, 75 or 80 feet downstream. Only 50 yards from the bridge the distribution of the debris evidenced that the wind was from an opposite direction. In all, about 30 buildings were destroyed, but no one was killed or seriously injured. A man walking home in the path of the storm saw it coming, so lay down and took hold of a fence post. He was whipped around and his flesh lacerated by flying sand and dirt, but not hurt much. A cow was blown past him on one side and a horse on the other in a moment's time. Those who saw the cloud say it was funnel shaped, but not steady, tipping from side to side and rising and falling. We have evidence of

its rising and falling from the fact that there are stretches of country uninjured but for a few fallen trees. Up in the air 100 feet or so it appeared to be full of limbs of trees, doors, shingles, and other débris. According to eyewitnesses, it whirled around in the direction of the hands of a watch.

Mr. Clarence J. Root, section director, Springfield, Ill., says:

Many of the numerous thunderstorms during the month were very severe, and reports of fire and damage by lightning were received from many places in the central and northern parts of the State. Barns and stock were destroyed and some houses damaged, and electric service was crippled in some cases. No direct fatalities were reported. In some places severe wind squalls accompanied the storms, blowing down corn, injuring fruit, and damaging buildings and shade trees. A severe storm occurred in the vicinity of Springfield on the 6th. The most severe storm of the month is believed to be the one that visited Springfield and Sangamon County on the 13th. It is thought that the worst of this storm was confined to Sangamon County, because the damage in Macon and Christian Counties was much less and no damage was reported in other border counties.

Following are reports of the storms that occurred at Springfield, Ill., on the 6th and 13th:

SEVERE WIND STORMS AT SPRINGFIELD, ILL.

STORM OF SEPTEMBER 6, 1911.

By J. C. JENSEN, Assistant Observer.

A severe local rain and wind storm, during which the wind attained a maximum velocity, for a five-minute period, of 48, and an extreme velocity of 58 miles an hour, passed over the city between 10 and 11 p. m. This velocity equals the station record and is the highest since April 26, 1902, when a maximum velocity of 48 miles an hour was recorded.

Although not confined to any specific portion of the city, the storm seems to have been the most severe in the west and central parts.

Numerous plate-glass windows were blown in, signs and cornices torn from their moorings, and trees and small buildings blown over or demolished. The streets in all parts of the city were strewn with large branches, whole trees, and débris of various kinds, to the extent of obstructing street-car and other traffic at some points. Telephone and electric light and transit wires suffered severely from broken poles and falling trees. A large tent near the center of the city was blown down. In addition to the plate glass, many windows in the residence districts were broken either directly by the force of the wind or by flying débris. A horse was reported killed by lightning east of the city.

In the country considerable fruit was blown from the trees but the damage to corn was not important. The loss in Springfield and vicinity is conservatively estimated at \$10,000.

STORM OF SEPTEMBER 13, 1911.

By CLARENCE J. ROOT, Section Director.

Early on the morning of September 13, 1911, a severe windstorm visited Springfield and Sangamon County, and its influence was felt in some of the neighboring counties. The wind accompanied a thunderstorm that moved from the northwest. A moderate squall occurred at 1.35 a. m. A second squall was severe from 4.06 to 4.11 a. m., with a maximum wind velocity of 46 miles and an extreme velocity of 50, both from the northeast. The third and most severe storm lasted from 4.50 to 5 a. m. The maximum wind velocity for five minutes was 46 miles, but from 4.54 to 4.56 a. m. 2 miles were recorded at a high rate, the velocity of the faster mile being at the rate of 61 miles per hour, beginning at 4.54 a. m. Undoubtedly

there were short puffs of wind at a much higher velocity. The direction had been varying between east and northeast, but at 4.49 it changed to northwest. At 4.55 a. m., in the middle of the highest wind it returned to northeast. The record maximum for the station is 48 miles, made September 6, 1911, and other dates. The barometer rose suddenly 0.20 inch during the last squall but fell the full amount in a few minutes.

While nearly all parts of the city suffered, the area of greatest destruction occupied the territory bounded by the B. & O. R. R. and the business district on the north, Eighth Street on the east, South Grand Avenue on the south, and West Grand Avenue on the west, except that there was very little damage done in Washington Park. This territory embraces a little more than a square mile. Considerable damage occurred locally at a number of other places. In the north and east parts of the city the effects of the storm were less marked and but little damage resulted.

It is not thought that the storm was of a tornadic nature. No single storm cloud was observed, but one witness states that the sky was overcast with a seething, rolling, mass that had the appearance of boiling. Another witness describes the clouds in the same manner and states further that these clouds were moving from the northwest, and that during the highest wind, when the trees and limbs were crashing down, the clouds suddenly reversed their direction, blowing from the southeast. When the clouds came together they had the appearance of water waves striking a pier. It is thought that this occurred at the time of change in wind direction as mentioned above. While trees fell in all directions, the general direction in all parts of the city was toward the southeast. In some cases the trees in a single yard lay in several directions.

The storm of September 6 was pronounced by old residents to be the worst wind storm in the history of the city, but compared with the later storm it was of minor importance.

The greatest single loss was the damage to the Illinois State Capitol Building. Two sections of the copper roofing on the dome were ruined and a large part of the main building lost its copper roof. Large sheets, 50 to 75 feet long, were ripped from the roof and dome, crinkled up like paper and hurled to the ground. The loss was \$25,000. A small concrete plant on Jefferson Street, part of which was used as a dwelling, was destroyed and the occupants had a narrow escape. The second story of a house across the street was crushed by flying timbers. Among the other important losses are the following: Sattley Plow Works, wall of warehouse blown down, loss \$2,500; State Fair Grounds, loss \$5,000; north wall of boiler works; the back of the three-story building occupied by the Capital City Garage was blown 18 inches out of plumb; at the West End coal shaft an 80-foot stack fell on the engine house, destroying it. Hundreds of business houses and residences were more or less damaged, some by wind and others by falling trees and limbs. The injuries were in most cases of a minor character. Many signs, billboards, and windows were damaged or destroyed, and a number of business houses suffered from the rain entering through the broken windows and roofs.

The most notable feature of the storm was the damage to the city's shade trees. Springfield is noted for its beautiful trees, especially throughout the district most affected by the storm. Hundreds of trees were either broken off or uprooted, and thousands were partially or entirely stripped of limbs and branches. In many places the streets were impassable. Nearly every yard in the